

# NICER Joint Programs

The NICER mission has established joint observing programs with NASA's Nuclear Spectroscopic Telescope Array (NuSTAR), Neil Gehrels Swift observatory (Swift), and Transiting Exoplanet Survey Satellite (TESS), which allow NICER GO proposers to request correlated observations. Proposals requesting joint observations must clearly justify the need for the NuSTAR/Swift/TESS observations in order to accomplish the science goals of the NICER investigation. Details of these joint programs are provided below.

## NuSTAR

Combined NICER and NuSTAR observations are a powerful diagnostic of high-energy sources, in the total energy range 0.2–79 keV. NuSTAR has made up to 400 ks available to NICER Cycle 5 proposers who wish to take advantage of this opportunity. Proposals requesting NuSTAR coordinated observations must demonstrate the unique value of adding NuSTAR exposures for the proposed science and present a detailed feasibility case in its support. Joint observations with NuSTAR must be designated as Category A or B to be approved for observations in Cycle 5. Each target for which NuSTAR time is requested must also have an associated NICER time request.

The requested NuSTAR exposure time per observation (i.e., a single visit to a target) is constrained to a minimum of 20 ks and the time interval between successive visits must be  $\geq 14$  hours. Sources with fluxes  $>10^{-11}$  ergs s<sup>-1</sup> cm<sup>-2</sup> within 5° of the target may cause increased non-uniform background gradients due to stray light. Users should check observations for potential stray-light contributions using the tools available at <http://nustar.caltech.edu/page/researchers>. If a field is designated as heavily contaminated, proposers should submit a request for a feasibility analysis to [nustar-help@srl.caltech.edu](mailto:nustar-help@srl.caltech.edu) at least two business days prior to the proposal submission deadline.

NuSTAR observations of high count-rate targets ( $>50$  cps/NuSTAR focal-plane module) require special planning and increased downlink capacity. High count-rate observations of duration  $>30$  ks are difficult and can be accepted only if well motivated. High count-rate observations longer than 75 ks will be considered only if the total requested time is distributed in multiple observations, each with exposure time  $<75$  ks and separated by more than 1 week.

Proposers should carefully review NuSTAR technical documentation available from the NuSTAR websites: <http://nustar.caltech.edu> and [https://heasarc.gsfc.nasa.gov/docs/nustar/nustar\\_prop.html](https://heasarc.gsfc.nasa.gov/docs/nustar/nustar_prop.html).

# TESS

Rapid cadence photometric observations within the continuous viewing intervals as enabled by NASA's Transiting Exoplanet Survey Satellite (TESS) have the potential to enhance the value of certain NICER observations. As such, the NICER and TESS management teams have established a joint-program cooperative arrangement with the goal of facilitating such possibilities. Through this joint program, proposers to the NICER General Observer (GO) program can be awarded new TESS targets within fields of view to be covered by the TESS observation plan during the relevant NICER GO cycle. The scientific investigations that will be supported within this program are those that can be, in the judgment of NASA-convened peer-evaluation committees, enhanced by the combination of new NICER and TESS observations.

Specifically, investigators affiliated with and resident at US institutions proposing to the NICER program are eligible to be awarded TESS targets. A total of allotment of 300 2-minute cadence target slots and 50 20-second cadence target slots will be made available through this program. It is required that the observations proposed can be accommodated within the TESS observation plan and meet all technical and programmatic requirements of that mission. Requests for time-constrained observations or target of opportunity (ToO) observations are permissible provided that they similarly satisfy these requirements. ToO requests could pertain to known objects or to generic object classes which could fortuitously be covered in the TESS observing plan. Only single-year NICER programs are eligible for inclusion in this joint program.

Proposers intending to request joint NICER-TESS observations are strongly encouraged to first review the mission specific information available from the [TESS Science Support Center](#) web site. They will also be required to append a brief technical justification, comprising one-page or less of text, to their regular 4-page scientific justification text. The scientific justification should detail whether 2-min or 20-sec cadence is needed to meet the goals of the proposal (and why the 10-min cadence Full Frame Image data are not sufficient). General criteria to be considered by the evaluation committees will include:

- The suitability of using new TESS data products for the proposed investigation;
- The extent to which the investigation complements and enhances the anticipated science return from the TESS and NICER missions;
- The degree to which the proposed investigation places demands upon mission resources; and
- The degree to which the proposed investigation capitalizes on the unique capabilities of TESS.

Joint program requests will be subject to technical evaluation by both mission teams prior to the usual peer-evaluation process. Information resulting from those evaluations may be made available to the scientific peer-evaluation committees.

## Swift

*The flexibility and multiwavelength coverage as enabled NASA's Neil Gehrels Swift Observatory (Swift) has the potential to enhance the value of certain NICER observations. The NICER and Swift management teams have therefore established a reciprocal and cooperative agreement in which Swift observing time up to 200 ks per year is made available for coordinated observations with NICER to facilitate those possibilities. The scientific programs supported under this program are restricted to those that are enhanced by the combination of NICER observations with investigations using the multi-wavelength Swift observatory. Proposals may be time-constrained, including coordinated, monitoring, and ToO observations. Proposals requesting Swift coordinated observations must demonstrate the unique value of adding Swift exposures for the proposed science and present a full and detailed feasibility case in its support. The award of time shall occur without further scientific review by the Swift mission.*

*All standard observing restrictions for both observatories will apply to joint proposals under this program. The Swift Project will perform feasibility checks on the proposed observations and reserves the right to reject any observations determined to be technically unfeasible for any reason.*

*Proposers intending to request NICER-Swift observations are strongly encouraged to first review the mission specific information from [Swift Technical Handbook](#) or the [Swift GI webpage](#). The [Swift Helpdesk](#) and/or the [HEASARC Helpdesk](#) can be contacted in case of questions.*